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## Where does groundwater come from?

Rain is the principle source of fresh water in Hawaii, with an annual rainfall rate that ranges between 10-460 inches.

The hydrologic cycle describes water movement through the environment. Groundwater, which originates at the surface as rain, is part of the hydrologic cycle. As warm, moisture-laden air moves across the ocean, it comes into contact with the islands, rises over the mountains, and cools. Cool air holds less moisture than warm air; therefore, the moisture condenses and forms clouds, and it rains. Rain falling on the land's surface may seep down into the soil or run off into streams, rivers, or surface water reservoirs. Water that filters through the soil is taken up by plants or moves through the unsaturated zone to become groundwater. Replenishment of the groundwater is known as *groundwater recharge* and areas where it occurs are called *recharge areas*. Water that runs off into streams, rivers, or reservoirs can remain as surface water, recharge the groundwater, or evaporate. Water returned to the atmosphere through evaporation from surface waters or from transpiration (the release of water through the leaves and stems of plants) enters the hydrologic cycle again eventually to return as precipitation. According to the U.S. Geological Survey, groundwater recharge in an island watershed may be equal to 225 million gallons per day. That is, 39% of the area's total rainfall becomes groundwater.



## Land use affects groundwater quality.

Groundwater quality is affected by what happens above and below the land's surface. Many human activities on the land affect the quality and quantity of groundwater. Until recently it was generally believed that the soil had the capacity to filter any material that was spilled on the land. However, trace amounts to larger quantities of chemicals have been detected in drinking water supplies within areas of the United States, including Hawaii.

As a substance moves through the soil, physical, chemical, or biological changes may occur to its chemical structure. In some cases, these changes lessen potential toxicity; however, in other cases, as with substances containing heavy metals and certain pesticides, the substance may not degrade into a harmless substance before it reaches the groundwater. Thus, careful land use planning and management are necessary to protect groundwater supplies from activities which may degrade valuable water resources.

## What can you do in your community?

1. Educate yourself and others about groundwater and its protection. Schedule programs for community groups.
2. Identify your drinking water resources and nearby land uses.
3. Know the quality of the groundwater in your area. The Safe Drinking Water Act requires that each public well be regularly sampled and this information is available publicly.



## Groundwater is on the move.

Groundwater is not stationary. It is constantly moving within the saturated zone through pore spaces and voids. Groundwater movement may be rapid or may be very slow, moving only one foot per year. Groundwater moves from areas of recharge to areas of discharge. A spring is an example of groundwater discharge. Most often, groundwater moves from areas of higher to lower elevations. In some instances, waterfalls originating on mountain sides after heavy rains are the result of groundwater discharge.

Wells are placed into groundwater to provide water for human use. Wells can be either public (provide water to a large number of people) or private (provide water to one household). Public wells are maintained by the city and county and are monitored regularly to ensure drinking water quality is safe. Maintenance of private wells is currently the responsibility of the homeowner.

The quality of Hawaii's groundwater is considered to be outstanding. All water, even in Hawaii, however, contains some amount of naturally occurring, dissolved substances. Some substances which occur naturally in Hawaii's groundwater include iron, magnesium, silica, sodium, and chloride.

## What can you do around your home?

1. Many common household products contain substances that are considered hazardous, including batteries, motor oil, gasoline, paint thinners, car wax and furniture polish, oven, drain, and toilet cleaners, fertilizers, and pesticides.
2. Properly maintain your septic system.
3. Conserve water.
4. If you have a private well, have it tested regularly.
5. Become involved in your community and promote groundwater protection efforts.
6. Upgrade your cesspool to a septic system.



4. Work towards local zoning decisions which protect groundwater resources and their recharge areas.
5. Identify existing protection programs and determine their strengths and weaknesses. Work toward better protection programs.
6. Encourage the adoption of sound design and operating standards for businesses, industries, and residential areas especially in sensitive aquifer recharge areas.
7. Adopt water conservation programs.
8. Develop and promote household hazardous waste collection programs to ensure proper disposal.
9. Develop a septic system management program to ensure proper installation and maintenance of septic systems.



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# WATER QUALITY Groundwater

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## Water Facts

- Turn off the water while you brush your teeth and save about 100 gallons a month.
- On average, 50-70 percent of household water is used outdoors for watering lawns and gardens. Find plants that are adapted to the local climate and don't need a lot of additional water.
- Americans drink more than 1 billion glasses of water a day. Fill a pitcher with tap water and put it in your refrigerator.

## What is groundwater?

Groundwater is the principle source of drinking water for residents in the islands. Additionally, groundwater is used for agricultural, industrial, and commercial uses. At high elevations, groundwater sustains stream flow.

*Groundwater* is water which is located beneath the surface of the earth within the *zone of saturation* where all the space between soil particles or voids in rock fill with water. The *water table* marks the top of the saturated zone. Above the water table is the *zone of aeration*, or the unsaturated zone, where spaces and voids between rock and soil contain both air and water.

